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MODIFIED RESISTED EXERCISES IN
THE TREATMENT OF ADVANCED
CARDIAC DILATATION

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MASSAGE, PASSIVE MOVEMENTS AND MODIFIED RESISTED EXERCISES IN THE TREATMENT OF ADVANCED CARDIAC DILATATION

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A GOOD many years ago the Nauheim treatment for cases of heart disease was introduced to the medical profession by the brothers Schott, and many were the discussions upon the subject to which it gave rise. I had the privilege of watching several cases treated by the artificial baths and associated exercises in the late Sir Thomas Grainger Stewart's wards, and the advantage of Dr G. A. Gibson's criticisms on the resultant changes produced in the patients' hearts. Certain of the patients benefited, others seemed to suffer harm; and I can recall one case—a man who had aortic incompetence together with pericardial adhesions—who was worse after each bath. Our present position seems to be one very different from what we had hoped: namely, that the Nauheim treatment has a very limited sphere of usefulness.

My reasons for bringing up a somewhat hackneyed subject is, that during the past few years I have seen the most astonishing benefit result from the application, not of baths,

but of successive periods of treatment by massage, followed by passive movements, and, later still, resisted exercises ; and this in a type of heart case usually deemed to be outside the sphere of the Nauheim method.

I tried the plan in cases of greatly dilated hearts, associated and unassociated with a pre-existing valvular lesion, where compensation was barely maintained, and in which rest and cardiac tonics had failed to yield any further benefit. In one patient, for example, whose heart was greatly dilated, notwithstanding five months of rest in bed, with the exhibition of strophanthus and attention to the general principles of treatment, there was great palpitation, great irregularity of the heart, insomnia, extreme debility, etc. After massage for ten days, followed by passive movements for ten days and ten days of resisted exercises, the patient was able to get up, take very gradually increasing active exercise, and is now possessed of a degree of compensation which enables her to be up all day, walk about to a moderate extent, and even undertake light work. Prior to the treatment the most trivial strain, such as a free action of the bowels, induced the greatest distress ; now her pulse is more regular, the heart has greatly diminished in size, the insomnia disappeared, and the patient's general health has greatly improved. In all the cases in which I have tried this plan of treatment, whether administered by experts or not, benefit has resulted, with the exception of those in which the age of the patient or the condition of the myocardium militated against the possibility of the heart being stimulated to a more normal state.

I propose first to refer to the probable effect of massage and exercises on the heart, then to discuss the grounds upon which we have a right to claim definite improvement, next to describe a few of my cases, and lastly to offer suggestions as to the kind of heart cases which are likely to benefit by a method which seems to me to be sometimes capable of achieving more than rest or any drug can perform alone.

Sir William Stokes, so long ago as 1854, recommended a regular course of gymnastic and pedestrian exercises for symptoms of debility of the heart.

Schott¹ states that the exercises produce periodical and

¹ *Lancet*, 1891, May 23rd and 30th.

regulated stimulation of the heart to increased action, and the muscle of that organ obeys the natural law governing relationships between exercise and nutrition or growth. This induces contraction of a dilated heart, and gain in force of pulse, as well as relief from dyspnœa. He thinks that a gymnastic course stimulates the heart to more complete contraction by reflex stimulation of cardiac centres, through the influence of exercise on the motor nerves. He quotes Lauder Brunton's and Tunncliffe's experiments to prove that muscular exercise first raises and then lowers blood pressure, and thereby accounts for the very considerable fall in pulse rate and tension after the immersion in the baths.

Sir Douglas Powell¹ considers that massage stimulates circulation in the muscles, hastens the venous circulation, and promotes passage of lymph through the lymph channels; thereby body metabolism is maintained and digestion and utilisation of food aided. The heart is stimulated to fuller systole, and possibly the coronary circulation is also improved.

Sir W. H. Broadbent² thinks exercises produce a physiological dilatation of the skin capillaries, and also the capillaries in the muscles, and so resistance to onward blood flow is lessened, and the left ventricle is relieved and able to complete systole, while the right heart is not overloaded, as it is by violent exercise. He has a difficulty in explaining the slowing of the heart (specially noted after the baths), because if the capillaries dilate, the heart ought to beat faster, but believes that reflex stimulation of the vagus may account for it.

Lauder Brunton³ considers exercises exert a very complex series of effects on the heart, alternate contractions and relaxations of vessels probably occurring. He thinks vessels in the splanchnic area may dilate, and so relieve the turgescence of the right side of the heart.

It is very difficult to offer any very cogent arguments in favour of, or against any of these theories, but it seems reasonable to suppose that massage, passive movements and resisted exercises brace up the cardiac muscle, perhaps of one side of the heart alone, more probably of both, whether they do so by

¹ Lumleian Lectures: "Diseases and Disorders of the Heart," 1899.

² "Heart Disease," 1897.

³ "Lectures on Actions of Medicine," 1897.

dilating capillaries or not. In the majority of my cases, the fact that the diminution of cardiac dulness is bilateral, suggests that both right and left sides of the heart are directly or indirectly benefited. Schott believed that the Nauheim baths and exercises were beneficial in nearly all chronic heart cases, and he thinks that only in patients who are the subjects of aneurysm or progressive arterio-sclerosis are they harmful, and not even in all of the latter group. Sir Douglas Powell believes resisted exercises are likely to benefit patients whose hearts are flabby and irritable, where there is fatty infiltration and impaired metabolism, in cases of venous plethora, in chlorosis with dilated heart, in chronic valvular disease with commencing failure of the heart, and lastly in suspected coronary atheroma he thinks they may be tried with caution. Sir William Broadbent considers exercises are not a substitute for other methods of treatment. Dr Gibson¹ refers to massage and passive movements as being of value in cases of grave inadequacy.

I believe the method to be useful as an adjunct to rest and cardiac tonics in many cases of cardiac dilatation, other, of course, than cases of acute endocarditis, and it is in extreme degrees of dilatation in which its cautious use has yielded striking results.

Much discussion has arisen as to whether it is possible to map in the heart with sufficient accuracy as to enable definite recognition of a decrease in size to be ascertained. Groedel, Leyden and others have urged that it is quite impossible to prove by percussion a definite contraction of the heart—while Broadbent, although admitting contraction, believes that the greater expansion of the lungs covers up the heart so as to diminish the absolute cardiac dulness. Professor Leith,² in an able paper read before this Society, asserts that even what is termed the apex beat does not yield accurate information, as it may, if the left lung expands, be produced by a different part of the anterior heart wall.

My own opinion is that careful percussion and the position of the apex beat taken together yield definite data, and this

¹ "Diseases of the Heart and Aorta," 1898.

² "The Transactions," vol. xv. New Series, 1895-6, p. 67: "Enquiry into the Action of Baths and Exercises, in the Treatment of Chronic Heart Disease."

method of observation is especially satisfactory if sufficient care be paid and a record taken from time to time. The heart varies naturally within very narrow limits, in health at all events, and if along with a smaller area of dulness and an apex beat displaced inwards there is less irregularity, fuller contractions of the ventricles, less dyspnœa, disappearance of œdema, a greater flow of urine in certain cases, improved digestion, and a general sense of greater well-being and ability to undertake exertion without an immediate breakdown of compensation, surely we are justified in claiming that the treatment which brings this about does reduce dilatation and tend to restore the heart to a more normal condition.

In several of my cases the treatment was commenced without any great belief in its success, and therefore I cannot supply some of the data which would make the results of more scientific value. I purpose describing briefly four cases, and referring to other six, and my apology for offering an incomplete paper to the Society is simply that the benefit obtained in some of my cases was so remarkable that I felt it right to give my experience for the benefit of others.

The method itself requires only brief reference. In none of my cases was the entire series of exercises as prescribed by Schott carried out. They were limited to such movements of the arms and legs as could be carried out with the patient in bed, and no particular movements were ordered. A guide as to the length of each separate application was obtained by noting the effect on the patient, and at no time was fatigue permitted. When the period of resisted exercise treatment was over, the patient was allowed to get up and a few minutes' slow walking replaced the exercises.

The period of time occupied each day with the successive methods of treatment varied with each individual case.

CASE I. Female, æt. 47, in June 1903 took a very hot bath, remaining in it for a long time, and the next day walked a much longer distance than usual and at a much faster rate. The following day she experienced a sensation of fluttering and weakness of the heart, felt faint and giddy, was breathless, and complained of a sharp stabbing pain and irritating chest cough. When I saw her I found that she had been vomiting

occasionally, had slept badly, and that her heart was much dilated as compared with measurements made several months previously. At the level of the fourth cartilages—whereas the right border had been $\frac{3}{4}$ inch to the right of the lateral sternal line, it was $2\frac{1}{4}$ inches, and the left border, which had been 5 inches to the left of the mid-sternal line, was 7 inches. The apex beat, which had been under the sixth rib, was felt under the seventh and situated in the anterior axillary line; there was diffuse pulsation and slight præcordial bulging. The pulse was intermitting every three or four beats, sometimes more frequently, and the beats were irregular in force and character. There was a systolic murmur in the mitral and tricuspid areas, epigastric pulsation and marked engorgement of the jugulars in the neck. There was œdema of the ankles, and also at both bases.

Her previous history was interesting. The patient on at least one occasion after lifting a heavy weight had a slight attack of the same kind. For the preceding six months the heart was, in my opinion, dilated, but only to a very trifling degree before the episode of the bath, but compensation had never been seriously lost up to this attack. The family history was unimportant, excepting that a sister had died at the age of 49 from "heart disease." The patient has had rheumatic pains in the ankles, feet and hands when a girl, but has been otherwise healthy until her heart began to trouble her. When I first examined the patient there was no definite cardiac murmur, although the first sound in the mitral area was impure.

After long continued treatment with strophanthus, rest in bed, etc., she began to improve, but after lifting a heavy box she had a severe relapse, followed again by improvement. Once more the patient over-strained her cardiac powers and she was completely confined to bed for six months. The slightest effort brought on the phenomena of loss of compensation, and in fact compensation was with difficulty maintained even with absolute rest in bed, and the administration of strophanthus and other cardiac and diffusible stimulants. Last April massage was commenced and kept up for ten days, followed by similar periods, first of passive movements and then of resisted exercises. On the twenty-first day after beginning massage the patient was allowed up for half an hour, and instead of exercises walked

slowly for five to ten minutes. Each day the amount of exercise was increased.

The pulse became more regular, intermitted less frequently, often only every 30 to 40 beats, and the patient ate and slept better. The daily pulse rate, which before beginning massage had been about 80 per minute, gradually diminished in frequency to 72 to 75; and the respirations, which were 25 to 30 before the treatment, diminished to 20 and 21. The apex was found to have returned to its old position just under the sixth rib in the mid-clavicular line, and the right and left borders of the heart were $\frac{3}{4}$ inch to the right of the right sternal border and 5 inches to the left of the mid-sternal line respectively. The cough had disappeared and there was no epigastric pulsation or distension of the veins in the neck. The urine almost doubled in quantity.

This patient has been under constant observation, and now at a period of eight months since being allowed out of bed there has been no relapse, and compensation is sufficiently established to permit of the patient being up all day, taking moderate exercise and even employing herself with sewing and similar light work. During the treatment I stopped all medicinal remedies, only resuming for a time a small dose of *strophanthus* (5m thrice daily) as a precautionary measure when the resisted exercises ceased.

CASE II. Female, æt. 73, suffering from dilatation of heart with mitral incompetence. She complained of pain over the heart and bronchitis. The history was as follows:—Two years ago dyspnœa became a marked feature and was associated with a long-standing bronchitis, which had troubled her for years, and especially in winter. Within the past weeks the urine has gradually diminished in quantity. The patient has had very hard work, but there is no history of alcoholism. The present condition before treatment is as follows:—There is a history of several attacks of influenza and rheumatism. Patient sits up in bed very dyspnœic, with slight œdema of feet and ankles, no ascites. The apex beat is in the seventh left interspace, fully 8 inches to the left of the middle line, and almost in the mid-axillary line. There is distinct præcordial bulging, and epigastric pulsations, systolic in time. A short presystolic leads up to a faint systolic murmur. The pulse is

74, irregular in time and force ; the arterial walls are somewhat thickened and the tension is high. The right heart extends fully 3 inches to the right of the right lateral sternal line, at the level of the fourth rib. There is a basal œdema of the lungs, especially on the left side, and a few rhonchi are audible. The urine is markedly deficient in quantity, and there is a trace of albumen.

Treated with absolute rest in bed, tincture of strophanthus, spirit of chloroform and aromatic spirit of ammonia, and later with liquor strychninæ, slight improvement resulted ; but between the 14th June and the 2nd August, when massage was commenced, the total benefit was very limited, and for several weeks preceding the massage there was no appreciable gain.

On the 2nd August massage alone was begun ; on the 9th, passive movements ; and on the 16th, resisted exercises, limited, however, to those possible in bed. After a week's treatment by resisted exercises, patient was allowed up for two hours and the exercises were replaced by a very short walk. The heart diminished considerably in size, the measurements being 2¼ inches to the right of the lateral sternal line at the level of the fourth rib, and the apex beat was found to be in the sixth space and 6½ inches to the left of the mid-line. There was still obvious systolic pulsation in the epigastrium, but the œdema of the legs and ankles had almost, and the pulmonary œdema had entirely, disappeared. The urine had considerably increased in amount.

The rate of pulse and respiration during the period of massage are interesting. The immediately previous figures for the pulse were : 74, 72, 80, 84, 82 ; and for the respirations, 26, 32, 28, 25, 28.

		Pulse.		Respira-			Pulse.		Respira-	
				tions.					tions.	
Massage begun.	}	Aug.	2	80	24	Resisted exercises begun.	Aug.	12	60	28
			3	80	24			13	60	32
			4	80	26			14	72	28
			5	84	22			15	64	28
			6	78	24			16	62	24
			7	78	26			17	60	24
			8	72	24			18	58	24
			9	82	26			19	60	24
Passive movements begun.	}		10	62	28			20	58	22
			11	64	26			21	58	23
								22	60	24

After stopping the treatment the pulse kept pretty regularly 65-75, and the respirations 20-24. The pulse greatly improved in respect to regularity. The patient was discharged from hospital, feeling greatly better, on the 23rd of September, and although not able to go about much was able to be up and to walk a little every day.

CASE III. Female, æt. 44, a housekeeper, admitted to Ward 27 on 5th July 1904, complaining of "giddiness in the head and swelling of the abdomen, legs and feet."

Her work is fairly hard, but she has been in a country situation, has good food, and is able to get plenty of fresh air and exercise. There is a history of epilepsy, the fits coming on 22 years ago, and induced, patient states, by a severe shock, the doctor who was attending her going off his head and throwing cold water over her. These fits have continued at intervals ever since.

In March 1904 she was admitted to Ward 27, with evidences of loss of compensation. She was found to have mitral presystolic and systolic murmurs, a dilated right heart, and to be suffering from œdema of lungs and of legs. Treated with rest and strophanthus, she improved and left hospital on June 7th. She only kept well for a few days, and on attempting to resume work she had a severe relapse, the œdema increasing, and she became very breathless. She was readmitted 6th July 1904, with greatly increased dyspnœa, orthopnœa and severe cough. The præcordia bulges slightly, and there is diffuse pulsation. The apex beat is in the sixth space, $6\frac{1}{2}$ inches to the left of the middle line, and the right border of the heart is almost 3 inches to the right of the mid-sternal line at the level of the fourth cartilage. She has an extremely irregular heart and pulse, the latter being irregular both in force and time. There is no marked epigastric pulsation, and little distension of jugular veins in the neck. There was marked basal œdema, but it considerably lessened before massage was commenced. The legs are œdematous. The urine averages 60 oz. a day, and contains a slight trace of albumen.

After admission, and up to 28th July, the patient improved considerably, but the œdema persisted, and the patient did not

sleep well at nights. There was still orthopnoea. Tincture of digitalis in 5m doses was prescribed, with caffeine citrate and an occasional dose of calomel and other purgatives. The irregularity remained the same, and there was no change in the position of the apex beat or cardiac borders.

On the 28th July, massage was commenced.

„ „ 5th August, passive movements.

„ „ 12th „ resisted exercises, limited to the arms and legs, and performed with the patient in bed.

On the 19th August the patient was up for one hour, and took a short walk up and down the ward, and by the 1st September the patient was up for the whole afternoon.

The improvement was as follows:—The apex beat was found to be in the fifth space, barely 5 inches from the mid-sternal line, and had come in over 1½ inches, while the right border was only 1½ inches in the fourth space to the right of the middle line. There was certainly irregularity, although less marked, but the improvement may be judged by glancing at the pulse rate and respirations, and by the patient's weight.

		Pulse.	Respira- tions.			Pulse.	Respira- tions.		
	July	6	86	32		July	29	68	20
	"	7	72	30		"	30	60	20
	"	8	88	28		"	31	64	18
	"	9	94	28		Aug.	1	60	20
	"	10	80	26		"	2	60	20
	"	11	72	24		"	3	72	20
	"	12	68	24		"	4	60	20
	"	13	80	24	Passive movements begun.	"	5	74	20
	"	14	72	24		"	6	74	20
	"	15	80	24		"	7	88	20
	"	16	76	24		"	8	60	20
	"	17	82	24		"	9	56	20
	"	18	72	22		"	10	60	20
	"	19	80	24		"	11	64	20
	"	20	88	24	Resisted exercises begun.	"	12	76	20
	"	21	72	24		"	13	76	24
	"	22	...	...		"	14	74	22
	"	23	...	...		"	15	74	22
	"	24	...	...		"	16	74	20
	"	25	...	...		"	17	80	28
	"	26	...	...					
Massage begun.	"	27	...	...					
	"	28	60	20					

		Pulse.	Respira- tions.			Pulse.	Respira- tions.
Up for 1 hour. }	Aug. 18	76	24		Aug. 25	68	24
	„ 19	74	22		„ 26	76	24
	„ 20	76	24		„ 27	68	24
	„ 21	74	24		„ 28	76	24
	„ 22	72	24		„ 29	76	24
	„ 23	70	24		„ 30	68	24
	„ 24	68	24		„ 31	68	24
					Sept. 1	72	22
		Weight. stones. lbs.				Weight. stones. lbs.	
July 28	.	9	7½	Aug. 25	.	9	12
Aug. 1	.	9	9	Sept. 1	.	10	1
„ 18	.	9	12				

While the treatment speedily yielded good results with this patient—sleeping, eating and feeling better—she relapsed soon after going home, and the early rise of pulse and respiration rates after the resisted exercises ceasing, suggested that the eventual success was not up to the early promise, and this was borne out by an increase in the size of the heart, although not to its former dimensions.

CASE IV. Male, æt. 42, had suffered from long-standing bronchitis, and when I saw him had a markedly dilated heart with both mitral and tricuspid incompetence. He was extremely cyanosed and breathless, unable for any exertion and almost entirely confined to bed. There was slight œdema of both bases, with a considerable amount of watery sputum, and the ankles were swollen. There was no very definite history of rheumatism, and the cardiac condition dated from a severe attack of influenza two years previously.

Examination of the circulatory system showed marked præcordial bulging, with a diffuse, somewhat heaving, cardiac impulse. The jugular veins were engorged and there was a visible venous pulsation. The apex beat was found to be situated in the seventh space and almost in the anterior axillary line, while the right and left borders of the heart were respectively 3 inches and 6½ inches from the middle line at the level of the fourth cartilages. There was marked epigastric pulsation, systolic in time. The heart was extremely irregular in both rhythm and force, and was 95 per minute. The urine was markedly diminished, being barely 15 ounces a day, and there was a trace of albumen. Complete rest in bed with the administra-

tion of strophanthus, diuretin and diffusible stimulants greatly alleviated the symptoms, but after six weeks' treatment the improvement ceased and no further progress was made. The right and left borders of the heart were found to have come in about $\frac{1}{2}$ inch and 1 inch respectively, but any attempt at getting the patient out of bed increased the dyspnœa, although the basal œdema had disappeared and the urine had increased to a daily average of 25-30 ounces.

The pulse was 85, but still extremely irregular in rhythm and force. After waiting for a month I cautiously tried massage for ten days, and followed it up by similar periods of passive movements and resisted exercises, and in three weeks the patient began active exercise in the shape of short walks of ten minutes' duration, which were gradually increased. During this period the strophanthus and diuretics were stopped, and only diffusible stimulants administered. The improvement at once recommenced before the period of massage was completed, and the heart became much more regular, the ventricles contracting more slowly and completely, and the pulse rate gradually fell to 75 (about the normal rate for the patient), while the irregularity almost completely disappeared.

The apex beat was found at the conclusion of the treatment to be under the sixth rib, just in the mid-clavicular line, and the right and left borders of the heart at the level of the fourth cartilages were found to be 2 inches and 5 inches respectively from the mid-sternal line.

The urine had increased to 50-60 ounces a day, and the trace of albumen had disappeared.

There was no dyspnœa on moderate exertion, and the jugular and epigastric pulsation had vanished.

This patient is now able to be up all day, and has had no relapse. A year has passed, and during that time the amount of exercise has been gradually increased without any untoward result. It is interesting to note that the bronchitis has not troubled him to the same extent, and that he is in better health now than he has been for many years.

Of my other six cases, three were men and three women. Two—a man aged 45 and a woman aged 41—had both aortic and mitral incompetence, and the other four—two men aged

69 and 32 and two women 45 and 52—had mitral and tricuspid incompetence. All showed marked cardiac dilatation, with loss of compensation and evidences of backward pressure, including œdema of legs and bases of lungs, diminished flow of urine, etc. The same treatment was tried in each case, and with success in four. In one of the unsuccessful cases, the man with aortic and mitral incompetence, it seemed to be hurtful and had to be stopped, and in the other patient with aortic incompetence very little benefit accrued from most carefully regulated treatment. I have also found that in cases of dilatation with mitral stenosis the benefit obtained from this treatment, while satisfactory, was limited, and did not yield such permanent results as in the other cases.

In noting diminished area of cardiac dulness, the diminution naturally depended much on the degree of true dilatation present representing to a great extent at least the amount of compensation lost. Even where hypertrophy was marked, improvement occurred, but the excess dilatation was probably the factor which explained the cardiac contraction. I have not tried radiograms of the heart for obvious reasons, but if successful and also possible that method would be much more exact. Evidently aortic cases do not suit so well for this method of treatment, but my experience is far too limited with regard to them.

Even eight successes or moderate successes out of ten cases so treated seems to me to warrant the systematic trial of this method. It is impossible to make any definite statement as to the permanent value of the treatment even in the eight cases called successful. In over half of them considerable periods have elapsed without any breakdown of compensation, varying from over two years to six months. One case I know has relapsed, although I should hardly term it a complete failure.

In conclusion, I must express my thanks to Dr Bruce, in whose wards two of the cases were treated, for permitting me to use the notes in the case-books; to Dr Lorimer, who helped me with some of the observations on these two cases; and lastly, to Miss Gustavsohn, whose careful massage and application of the passive movements and resisted exercises materially aided me in obtaining successful results with four out of the ten cases.

